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UNITED STATES DEPARTMENT OF COMMERCE**
Washington, D.C. 20230

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FEDERAL COMMUNICATIONS COMMISSION
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Ms. Magalie Roman Salas, Esq.
Office of the Secretary, TW-A306
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554-0001

Dear Ms. Salas:

Subject: MM Docket No. 99-325 (FCC No. 99-327), Digital Audio Broadcasting Systems

The National Institute of Standards and Technology (NIST) offers comments for the Commission's consideration in the matter of Digital Audio Broadcasting Systems and Their Impact On the Terrestrial Radio Broadcast Service (MM Docket No. 99-325, FCC No. 99-327).

The adoption of a digital broadcast standard to supplement or eventually replace AM and FM mass-media aural services offers a unique opportunity to address a related, non-aural problem commonplace in modern consumer electronics: the timekeeping function of the radio receiver.

NIST proposes that the Commission consider as part of its rulemaking the desirability, appropriateness, and technical requirements for standardizing a portion of the digital bit stream in these services for the purpose of the continual communication of the correct, current time. NIST makes this request in its capacity as the civilian provider of official time in the United States, with a responsibility for the means and methods to enable clocks to be made concordant with the national standards. This responsibility for U.S. timekeeping is shared with the U.S. Naval Observatory, which focuses most of its efforts on supporting the timing needs of the Department of Defense.

The NIST point of contact on this matter is Dr. Donald B. Sullivan, Chief, Time and Frequency Division. He may be reached at (303) 497-3772, or by e-mail at donald.sullivan@nist.gov.

The Notice of Proposed Rulemaking indicates the Commission's interest in auxiliary services and in identifying design issues of public interest dimension.

Sincerely,

Andrew J. Pintus

Enclosure

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Before the
Federal Communications Commission
Washington, DC 20554-0001

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
)
Digital Audio Broadcasting Systems)
And Their Impact On the Terrestrial Radio) MM Docket No. 99-325
Broadcast Service.)

COMMENTS ON NOTICE OF PROPOSED RULE MAKING

Submitted: December 10, 1999

The National Institute of Standards and Technology (NIST) offers comments for the Commission's consideration in the matter of Digital Audio Broadcasting Systems And Their Impact On the Terrestrial Radio Broadcast Service (MM Docket No. 99-325, FCC No. 99-327).

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HISTORICAL CONTEXT

Dissemination of the correct time through radio broadcasting is a well-established concept.

The National Bureau of Standards (NBS), the predecessor agency to NIST, began broadcasting timing signals from short-wave radio station WWV in 1923. Today this radio station is located in Fort Collins, Colorado. Its sister station WWVH in Kauai, Hawaii, began service in 1948. Since 1956, a separate long-wave service, WWVB, has also broadcast from Colorado.

As important as these radio services are for maintaining standard time throughout the United States, neither their broadcast power nor propagation characteristics make them entirely suitable for broad consumer application. This is in contrast to Europe where, owing to the shorter distances involved, German radio station DCF 77 (similar in characteristic to WWVB) has enabled the widespread use of radio-synchronized clocks and watches. Similarly, the satellite line-of-sight requirement for obtaining time signals from the Global Positioning System (GPS) satellites makes this an awkward system for consumer clocks.

In the United States, efforts at using mass media for time dissemination have hitherto focused on broadcast television. In the early 1970's, NBS developed a time distribution system that placed a hidden time code on an unused part of the broadcast television signal. A decoder in the television set could recover and display the time. However, there was little need in the 1970's for using television sets as clocks, and the system was not implemented. Nevertheless, this technology found application for closed captioning, which became a huge success.

The Television Decoder Circuitry Act of 1990 led the Commission to adopt new standards and regulations regarding closed captioning services. Most recently, the Public Broadcasting Service (PBS) has used advanced captioning to communicate time to suitably equipped receivers, most notably videocassette recorders (VCRs). (This service utilizes the Extended Data Service (XDS) field allowed by §73.682(a)(22)(i) of the Commission's rules.) The ability of a VCR to set its clock automatically was a very welcome development in many households, thus finally realizing the original intent of the NBS research.

With the advent of Digital Television (DTV), the Advanced Televisions Systems Committee (ATSC) has adopted Standard A/65 concerning "Program and System Information Protocol for Terrestrial Broadcast and Cable." A component of this standard provides for the broadcast of current time information for such purposes as the automatic selection of programming. However, the standard calls for the accuracy of the data to be merely within 4 seconds of the correct time (either ahead or behind).

CURRENT CONTEXT

Today, a large number if not the preponderance of aural radio receivers being sold in the marketplace have timekeeping as a complementary function. In broad product categories, such as automotive radios and bedside alarm-clock radios, the timekeeping function is integral to the successful utilization of the product. According to the statistics provided by USADR in their Petition for Rulemaking (RM-9395, page 37), more than half of the radios sold annually in the U.S. are either automobile radios or "home table top and clock radios."

With the progress in digital electronics, clocks are proliferating throughout the household. They are found in dishwashers in order to take advantage of lower, nighttime electric rates. They are found in heating and air conditioning systems in order to "set back" the temperature during certain hours. They are found on stoves and ovens so that meals can be ready on schedule. They are found in other appliances, home entertainment systems, portable devices, computers, and on

and on. In modern life, one dreads having to reset all the household clocks after a power failure or when daylight savings time begins and ends.

The advent of digital radio to supplement or replace the mass-media AM and FM aural services provides a unique opportunity for the Commission to consider whether or not the public interest might be best served by adopting a broadcast standard that includes provision for the continual broadcast of the correct, current date and time.

ISSUES RAISED BY THIS COMMENT

NIST wishes the Commission to consider two issues. First, should the technical standard for broadcasting digital mass-media radio include provision for communicating the current date and time in the bit stream, in a manner that could be implemented in receivers without unnecessary complexity? Second, should there be a performance standard for those broadcast stations that utilize this capability?

The bandwidth requirement for the communication of time would be insignificant. The bandwidth of radio station WWVB is approximately 1 Hz, with a corresponding bit rate of 1 bit per second. Time information by its very nature is extremely redundant, eliminating the need for adjuvant error-correcting codes. Nor need there be a requirement for near-instantaneous acquisition of the time signal. WWVB takes a full minute to broadcast a complete frame of data (60 bits), requiring a receiver to spend several minutes acquiring the data and validating it against subsequent frames.

While the Commission or the marketplace may opt for a standard with a higher signal-acquisition rate than WWVB provides, the point still remains that provision of time would be an extremely low-overhead service in a bit stream consisting of hundreds of thousands of bits per second (in the FM band) or even tens of thousands of bits per second (in the AM band).

The Commission may question why provision for time service might be needed as a part of digital radio, given that broadcast time service already exists in other bands (e.g., short-wave, long-wave, television, and satellite services such as GPS). As a practical matter, the existing diversity of time services does not adequately address the need of the consumer-electronics marketplace for a robust and inexpensive solution. One cannot expect that clock radios situated in high-rise, urban buildings, particularly in the Northeast U.S., could receive an adequate long-wave, short-wave, or satellite signal, even with a much more costly and complex product. It makes so much more engineering sense for a single data stream to contain all the desired data for the end use.

Beyond application for clock radios, NIST envisions additional uses of such a broadcast service. The developers of the chip-sets for receiving digital radio could multiply their market several-fold if their circuits could also find application in all manner of home appliances, wristwatches, and wall clocks for the purpose of simply synchronizing the time.

The second issue that NIST requests the Commission to consider pertains to the accuracy of the time data transmitted with digital radio.

While NIST requests the Commission to consider the advisability of adopting a broadcast format conducive to the effective, broad dissemination of time information, NIST does not necessarily expect there to be a requirement for broadcasters to include time data with their programming. However, for those stations that do broadcast time, should there be a performance standard regarding its accuracy?

Modern radio often involves content that is pieced together from many cities through satellite relays, and perhaps even sent from studio to transmitter in the same city through satellite relay. The combination of transit-time delays and digital processing delays can easily create a situation where the careless handling of time data can compromise its quality and utility.

NIST provides high-precision time services directly to the public, and it is not our recommendation to create a new high-precision service here. Nevertheless, we do not believe that the 4-second accuracy standard adopted for DTV is adequate for many potential applications of broadcast time. NIST recommends that the Commission consider setting a standard, through regulation, that time broadcast through digital radio must enable the receiving clocks to be accurate to within one second of NIST reference time. We believe that public comment on this issue would show that one-second accuracy would be appropriate for such applications as traffic-light synchronization, event loggers (such as found in security systems), and time stamping of business transactions. It is worth noting that the National Association of Securities Dealers has recently implemented an SEC-approved rule requiring that member brokers time/date stamp all transactions within an uncertainty of three seconds of NIST time.

AM and FM radio stations constitute exactly the type of ubiquitous, redundant, high-power broadcast service that can penetrate most residential buildings to enable a mass market in radio-synchronized clocks. The present circumstance provides a unique opportunity for the Commission to act to allow such progress to occur.

Thank you very much for your consideration.